WHAT IS CLAIMED IS:

Proposed Patent Claims for
Method of Detecting Coliform Bacteria from Reflected Light

General Measurement and Correlation/Estimation Method

1. A method of determining the presence of coliform bacteria in water from light reflected therefrom, said method comprising the steps of:

(a) obtaining a measurement of reflected light from said water, said measurement comprising a measurement of the respective amount of light in at least three frequency ranges (i) from about 0.53 μm to about 0.60 μm ; (ii) from about 0.63 μm to about 0.69 μm; and (iii) from about 0.76 μm to about 0.90 μm; and
(b) relating the approximate amount of said coliform in said water to said respective amounts of light by applying an algorithm relating said respective amounts of light in said at least three frequency ranges to the amount of coliform bacteria in said water.

2. A method according to claim 1 wherein said at least three frequency ranges are all in the visible-reflective IR range.

3. A method according to claim 1 wherein said algorithm comprises a linear relationship between said approximate amount of said coliform in said water and the sum of (a) the ratio of one of said light measurements to a second of said light measurements and (b) the ratio of the second of said light measurements to the third of said light measurements.

4. A method according to claim 1 wherein said at least three frequency ranges are all within the detectable range of a silicon detector.

5. A method according to claim 1 wherein said measurement of the amount of light in said at least three frequency ranges comprises the measurement, respectively, of: (i) LANDSAT TM band 2, (ii) LANDSAT TM band 3 and (iii) LANDSAT TM band 4.

6. A method according to claim 1 wherein said algorithm is any algorithm selected from the group consisting of: $X \approx K_1 + K_2 \times (R32) + K_3 \times (R43)$ wherein:

X is the approximate amount of coliform bacteria expressed in colonies per milliliter;
K_1 is a value in the range of from about -175 to about –350;
K_2 is a value in the range of from about 250 to about 350;
K_3 is a value in the range of from about 200 to about 350;

R32 is the value of LANDSAT TM band 3 divided by LANDSAT TM band 2, after subtraction for atmospheric haze separately in each band; and
R43 is the value of LANDSAT TM band 4 divided by LANDSAT TM band 3, after subtraction for atmospheric haze separately in each band.

7. A method according to claim 6 wherein:

X is the amount of coliform bacteria expressed in colonies per milliliter;
K_1 is a value in the range of from about -200 to about –300;
K_2 is a value in the range of from about 275 to about 325;
K_3 is a value in the range of from about 225 to about 275;
R32 is the value of the amount of light of LANDSAT TM band 3 divided by the value of the amount of light of LANDSAT TM band 2, after subtraction for atmospheric haze separately in each band; and
R43 is the value of the amount of light of LANDSAT TM band 4 divided by the value of the amount of light of LANDSAT TM band 3, after subtraction for atmospheric haze separately in each band.

8. A method according to claim 6 wherein:

X is the amount of coliform bacteria expressed in colonies per milliliter;
K_1 is a value in the range of from about -265 to about –275;
K_2 is a value in the range of from about 300 to about 320;
K_3 is a value in the range of from about 225 to about 275;
R32 is the value of the amount of light of LANDSAT TM band 3 divided by the value of the amount of light of LANDSAT TM band 2, after subtraction for atmospheric haze separately in each band; and
R43 is the value of the amount of light of LANDSAT TM band 4 divided by the value of the amount of light of LANDSAT TM band 3, after subtraction for atmospheric haze separately in each band.

9. A method according to claim 1 wherein the calculated value of coliform correlates to the actual measured amount of said coliform in said water by a correlation value in excess of 60%.

10. A method according to claim 1 wherein the calculated value of coliform correlates to the actual measured amount of said coliform in said water by a correlation value in excess of 80%.

11. A method according to claim 5 wherein the calculated value of X correlates to the actual measured amount of said coliform in said water by a correlation value in excess of 60%.

12. A method according to claim 5 wherein the calculated value of X correlates to the actual measured amount of said coliform in said water by a

correlation value in excess of 80%.

13. A method according to claim 1 additionally comprising the step of generating a report of said approximate amount of said coliform in said water.

14. A method according to claim 5 additionally comprising the step of generating a report of said approximate amount of said coliform in said water.

15. A method according to claim 1 additionally comprising the step of transmitting data relating to the approximate amount of said coliform in said water to a site remote from the site where said measurement takes place.

16. A method according to claim 5 additionally comprising the step of transmitting data relating to the approximate amount of said coliformin said water to a site remote from the site where said measurement takes place.

17. A method of determining the presence of coliform bacteria in water from light reflected therefrom, said method comprising the steps of:

(a) obtaining a measurement of reflected light from said water, said measurement comprising a measurement of the respective amount of light in at least three frequencies comprising, respectively: (i) LANDSAT TM band 2, (ii) LANDSAT TM band 3 and (iii) LANDSAT TM band 4; and (b) relating the approximate amount of said coliform in said water to said respective amounts of light by applying an algorithm relating said respective amounts of light in said at least three frequency ranges to the amount of coliform bacteria in said water, wherein said algorithm is any algorithm selected from the group consisting of: $X \approx K_1 + K_2 \times (R32) + K_3 \times (R43)$ wherein:

X is the approximate amount of coliform bacteria expressed in colonies per milliliter;
K_1 is about -270;
K_2 is about 315;
K_3 is about 250;
R32 is the value of the amount of light of LANDSAT TM band 3 divided by the value of the amount of light of LANDSAT TM band 2, after subtraction for atmospheric haze separately in each band; and
R43 is the value of the amount of light of LANDSAT TM band 4 divided by the value of the amount of light of LANDSAT TM band 3, after subtraction for atmospheric haze separately in each band.

A method according to claim 1 additionally comprising the step of transmitting data relating to the approximate amount of said coliform in said water to a site remote from the site where said measurement takes place.

18. A method according to claim 17 additionally comprising the step of generating a report of said approximate amount of said coliform in said water.

19. A method according to claim 17 additionally comprising the step of transmitting data relating to the approximate amount of said coliform in said water to a site remote from the site where said measurement takes place.

Measurement Method followed by Transmission to Remote Processing Site

20. A method of determining the presence of coliform bacteria in water from light reflected therefrom, said method comprising the steps of:

(a) obtaining a measurement of reflected light from said water, said measurement comprising a measurement of the respective amount of light in at least three frequency ranges (i) from about 0.53 μm to about 0.60 μm ; (ii) from about 0.63 μm to about 0.69 μm; and (iii) from about 0.76 μm to about 0.90 μm.
(b) transmitting data relating to said measurement to a site remote from said measurement device and
(c) relating the approximate amount of said coliformin said water to said respective amounts of light at said remote site by applying an algorithm relating said respective amounts of light in said at least three frequency ranges to the amount of coliform bacteria in said water.

21. A method according to claim 20 additionally comprising the step of generating a report of said approximate amount of said coliform in said water.

Proposed Patent Claims for Apparatus for Detecting Coliform Bacteria from Reflected Light

Self-contained Measurement/Processor Apparatus

22. An apparatus for determining the presence of coliform bacteria in water from light reflected therefrom, said device comprising:

(a) a measurement device adapted to measure reflected light from said water, said measurement comprising a measurement of the respective amount of light in at least three frequency ranges (i) from about 0.53 μm to about 0.60 μm ; (ii) from about 0.63 μm to about 0.69 μm; and (iii) from about 0.76 μm to about 0.90 μm; and
(b) a processor capable of relating the approximate amount of said coliform in said water to said respective amounts of light by applying an algorithm relating said respective amounts of light in said at least three frequency ranges to the amount of coliform bacteria in said water.

23. An apparatus according to claim 22 wherein said at least three frequency ranges are all within the detectable range of a silicon detector, and wherein said measurement device comprises a silicon detector.

24. An apparatus according to claim 22 wherein said measurement of the amount of light in said at least three frequency ranges comprises the measurement, respectively, of: (i) LANDSAT TM band 4, (ii) LANDSAT TM band 3 and (iii) LANDSAT TM band 2.

25. An apparatus according to claim 22 wherein said algorithm is any algorithm selected from the group consisting of: $X \approx K_1 + K_2 \times (R32) + K_3 \times (R43)$ wherein:

X is the approximate amount of coliform bacteria expressed in colonies per milliliter;
K_1 is a value in the range of from about -175 to about – 350;
K_2 is a value in the range of from about 250 to about 350;
K_3 is a value in the range of from about 200 to about 350;
R32 is the value of LANDSAT TM band 3 divided by LANDSAT TM band 2; and
R43 is the value of LANDSAT TM band 4 divided by LANDSAT TM band 3.

26. An apparatus according to claim 25 wherein:

X is the amount of coliform bacteria expressed in colonies per milliliter;
K_1 is a value in the range of from about -200 to about –300;
K_2 is a value in the range of from about 275 to about 325;
K_3 is a value in the range of from about 225 to about 275;
R32 is the value of the amount of light of LANDSAT TM band 3 divided by the value of the amount of light of LANDSAT TM band 2; and
R43 is the value of the amount of light of LANDSAT TM band 4 divided by the value of the amount of light of LANDSAT TM band 3.

27. An apparatus according to claim 25 wherein:

X is the amount of coliform bacteria expressed in colonies per milliliter;
K_1 is a value in the range of from about -265 to about –275;
K_2 is a value in the range of from about 300 to about 320;
K_3 is a value in the range of from about 225 to about 275;
R32 is the value of the amount of light of LANDSAT TM band 3 divided by the value of the amount of light of LANDSAT TM band 2; and
R43 is the value of the amount of light of LANDSAT TM band 4 divided by the value of the amount of light of LANDSAT TM band 3.

28. An apparatus according to claim 22 wherein the calculated value of coliform correlates to the actual measured amount of said coliform in said water by a correlation value in excess of 60.

29. An apparatus according to claim 22 wherein the calculated value of coliform correlates to the actual measured amount of said coliform in said water by a correlation value in excess of 80.

30. An apparatus according to claim 27 wherein the calculated value of X correlates to the actual measured amount of said coliform in said water by a correlation value in excess of 60.

31. An apparatus according to claim 27 wherein the calculated value of X correlates to the actual measured amount of said coliform in said water by a correlation value in excess of 80.

32. An apparatus according to claim 22 additionally comprising a report generator adapted to generate a report of said approximate amount of said coliform in said water.

33. An apparatus according to claim 25 additionally comprising a report generator adapted to generate a report of said approximate amount of said coliform in said water.

34. An apparatus according to claim 22 additionally comprising a transmitter adapted to transmit data relating to the approximate amount of said coliform in said water from said processor to a site remote from the site where said measurement takes place.

35. An apparatus according to claim 25 additionally comprising a transmitter adapted to transmit data relating to the approximate amount of said coliform in said water from said processor to a site remote from the site where said measurement takes place.

36. An apparatus according to claim 22 wherein said measurement device is a camera.

37. An apparatus according to claim 22 wherein said processor is a microprocessor having programming instructions for applying said algorithm.

Specific Devices based upon selected Claims

38. A buoy comprising an apparatus according to claim 22.

39. A buoy comprising an apparatus according to claim 34.

40. A hand-held device comprising an apparatus according to claim 22.

41. A hand-held device comprising an apparatus according to claim 34.

42. A hand-held device comprising an apparatus according to claim 37.

More Algorithm-specific Self-contained Measurement/Processor Apparatus

43. An apparatus for determining the presence of coliform bacteria in water from light reflected therefrom, said device comprising:

(a) a measurement device adapted to measure reflected light from said water, said measurement comprising a measurement of the respective amount of light in at least three frequency ranges comprising, respectively: (i) LANDSAT TM band 4, (ii) LANDSAT TM band 3 and (iii) LANDSAT TM band 2; and
(b) a processor capable of relating the approximate amount of said coliform in said water to said respective amounts of light by applying an algorithm relating said respective amounts of light in said at least three frequency ranges to the amount of coliform bacteria in said water, wherein said algorithm is any algorithm selected from the group consisting of: $X \approx K_1 + K_2 \times (R32) + K_3 \times (R43)$ wherein:

X is the approximate amount of coliform bacteria expressed in colonies per milliliter;
K_1 is about -270;
K_2 is about 315;
K_3 is about 250;
R32 is the value of the amount of light of LANDSAT TM band 3 divided by the value of the amount of light of LANDSAT TM band 2; and
R43 is the value of the amount of light of LANDSAT TM band 4 divided by the value of the amount of light of LANDSAT TM band 3.
An apparatus according to claim 1 additionally comprising the step of transmitting data relating to the approximate amount of said coliform in said water to a site remote from the site where said measurement takes place.

44. An apparatus according to claim 43 additionally comprising a report generator adapted to generate a report of said approximate amount of said coliform in said water.

45. An apparatus according to claim 43 additionally comprising a transmitter adapted to transmit data relating to the approximate amount of said coliform in said water from said processor to a site remote from the site where said

measurement takes place.

System Using Transmission of Light Measurement Data to Processor

46. An system for determining the presence of coliform bacteria in water from light reflected therefrom, said device comprising:

(a) a measurement device adapted to measure reflected light from said water, said measurement comprising a measurement of the respective amount of light in at least three frequency ranges (i) from about 0.53 μm to about 0.60 μm ; (ii) from about 0.63 μm to about 0.69 μm; and (iii) from about 0.76 μm to about 0.90 μm; and
(b) a processor at said remote site and capable of relating the approximate amount of said coliform in said water to said respective amounts of light by applying an algorithm relating said respective amounts of light in said at least three frequency ranges to the amount of coliform bacteria in said water.

47. A method of developing an apparatus for determining the presence of coliform bacteria in water from light reflected therefrom, said device comprising:

(a) obtaining a measurement of reflected light from said water, said measurement comprising a measurement of the respective amount of light of at least two frequencies;
(b) developing an algorithm relating said respective amounts of light in said at least two frequencies to the amount of coliform bacteria in said water through linear regression analysis;
(c) producing a processor capable of relating the approximate amount of said coliform in said water to said respective amounts of light by applying an algorithm relating said respective amounts of light in said at least three frequency ranges to the amount of coliform bacteria in said water;
(d) providing a measurement device adapted to measure reflected light from said water and adapted to provide data relating to said measurement to said processor.

Proposed Patent Claims for
Method of Detecting E. Coli. from Reflected Light

General Measurement and Correlation/Estimation Method

48. A method of determining the presence of E. Coli. in water from light reflected therefrom, said method comprising the steps of:

(a) obtaining a measurement of reflected light from said water, said measurement comprising a measurement of the respective amount of light in at least three frequency ranges: (i) from about 0.52 μm to about 0.60 μm; (ii)

from about 0.76 μm to about 0.90m; and (iii) from about 1.55 μm to about 1.75 μm; and

(b) relating the approximate amount of said E. Coli. in said water to said respective amounts of light by applying an algorithm relating said respective amounts of light in said at least three frequency ranges to the amount of E. Coli. colonies in said water.

49. A method according to claim 1 wherein said measurement of the amount of light in said at least three frequency ranges comprises the measurement, respectively, of: (i) LANDSAT TM band 2, (ii) LANDSAT TM band 4, and (iii) LANDSAT TM band 5.

50. A method according to claim 48 wherein said algorithm is any algorithm selected from the group consisting of $X \approx K_1 + K_2 \times (R42) - K_3 \times (R52) + K_4 \times (R54)$ and equivalents wherein:

X is the approximate amount of E. Coli. expressed in colonies per 100 ml;
K_1 is a value in the range of from about -220 to about -420;
K_2 is a value in the range of from about 1750 to about 1950;
K_3 is a value in the range of from about 1130 to about 1330;
K_4 is a value in the range of from about 100 to about 300;

R42 is the value of LANDSAT TM band 4 divided by LANDSAT TM band 2, after subtraction for atmospheric haze separately in each band;
R52 is the value of LANDSAT TM band 5 divided by LANDSAT TM band 2, after subtraction for atmospheric haze separately in each band; and
R54 is the value of LANDSAT TM band 5 divided by LANDSAT TM band 4, after subtraction for atmospheric haze separately in each band.

51. A method according to claim 50 wherein:

K_1 is a value in the range of from about -300 to about -400;
K_2 is a value in the range of from about 1825 to about 1875;
K_3 is a value in the range of from about 1170 to about 1290;
K_4 is a value in the range of from about 175 to about 250;

52. A method according to claim 50 wherein:

K_1 is a value in the range of from about -310 to about -330;
K_2 is a value in the range of from about 1860 to about 1870;
K_3 is a value in the range of from about 1220 to about 1250; and
K_4 is a value in the range of from about 200 to about 220.

53. A method according to claim 48 wherein the calculated value of E. Coli.

correlates to the actual measured amount of said E. Coli. in said water by a correlation value in excess of 60%.

54. A method according to claim 48 wherein the calculated value of E. Coli. correlates to the actual measured amount of said E. Coli. in said water by a correlation value in excess of 70%.

55. A method according to claim 52 wherein the calculated value of X correlates to the actual measured amount of said E. Coli. in said water by a correlation value in excess of 60%.

56. A method according to claim 52 wherein the calculated value of X correlates to the actual measured amount of said E. Coli. in said water by a correlation value in excess of 70%.

57. A method according to claim 48 additionally comprising the step of transmitting data relating to the approximate amount of said E. Coli. in said water to a site remote from the site where said measurement takes place.

58. A method according to claim 52 additionally comprising the step of transmitting data relating to the approximate amount of said E. Coli. in said water to a site remote from the site where said measurement takes place.

59. A method of determining the presence of E. Coli. in water from light reflected therefrom, said method comprising the steps of:

(a) obtaining a measurement of reflected light from said water, said measurement comprising a measurement of the respective amount of light in at least three frequencies comprising, respectively: (i) LANDSAT TM band 2, (ii) LANDSAT TM band 3, and (iii) LANDSAT TM band 5; and (b) relating the approximate amount of said E. Coli. in said water to said respective amounts of light by applying an algorithm relating said respective amounts of light in said at least three frequency ranges to the amount of E. Coli. in said water, wherein said algorithm is any algorithm selected from the group consisting of $X \approx K_1 + K_2 \times (R42) - K_3 \times (R52) + K_4 \times (R54)$ and equivalents wherein:

X is the approximate amount of E. Coli. expressed in colonies per 100 ml;
K_1 is a value of about -321;
K_2 is a value of about 1864;
K_3 is a value of about 1235;
K_4 is a value of about 213;

R42 is the value of LANDSAT TM band 4 divided by LANDSAT TM band 2, after subtraction for atmospheric haze separately in each band;
R52 is the value of LANDSAT TM band 5 divided by LANDSAT TM band 2, after subtraction for atmospheric haze separately in each band; and

R54 is the value of LANDSAT TM band 5 divided by LANDSAT TM band 4, after subtraction for atmospheric haze separately in each band.

60. A method according to claim 48 additionally comprising the step of generating a report of said approximate amount of said E. Coli.

61. A method according to claim 48 additionally comprising the step of transmitting data relating to the approximate amount of said E. Coli. expressed in micrograms per liter in said water to a site remote from the site where said measurement takes place.

Measurement Method followed by Transmission to Remote Processing Site

62. A method of determining the presence of E. Coli. in water from light reflected therefrom, said method comprising the steps of:

(a) obtaining a measurement of reflected light from said water, said measurement comprising a measurement of the respective amount of light in at least three frequency ranges: (i) from about 0.52 μm to about 0.60 μm; (ii) from about 0.76 μm to about 0.90m; and (iii) from about 1.55 μm to about 1.75 μm;
(b) transmitting data relating to said measurement to a site remote from said measurement device; and
(c) relating the approximate amount of said E. Coli. in said water to said respective amounts of light at said remote site by applying an algorithm relating said respective amounts of light in said at least three frequency ranges to the amount of E. Coli. in said water.

63. A method according to claim 63 additionally comprising the step of generating a report of said approximate amount of said E. Coli. in said water.

Proposed Patent Claims for Apparatus for Detecting E. Coli. from Reflected Light

Self-contained Measurement/Processor Apparatus

64. An apparatus for determining the presence of E. Coli. in water from light reflected therefrom, said device comprising:

a measurement device adapted to measure reflected light from said water, said measurement comprising a measurement of the respective amount of light in at least three frequency ranges : (i) from about 0.52 μm to about 0.60 μm; (ii) from about 0.76 μm to about 0.90m; and (iii) from about 1.55 μm to about 1.75 μm; and

a processor capable of relating the approximate amount of said E. Coli. in said water to said respective amounts of light by applying an algorithm relating said respective amounts of light in said at least three frequency ranges to the amount of E. Coli. in said water.

65. An apparatus according to claim 65 wherein said at least three frequency ranges are all within the detectable range of a silicon detector, and wherein said measurement device comprises a silicon detector.

66. An apparatus according to claim 65 wherein said measurement of the amount of light in said at least three frequency ranges comprises the measurement, respectively, of: (i) LANDSAT TM band 2, (ii) LANDSAT TM band 4, and (iii) LANDSAT TM band 5.

67. An apparatus according to claim 65 wherein said algorithm is any algorithm selected from the group consisting of: $X \approx K_1 + K_2 \times (R42) - K_3 \times (R52) + K_4 \times (R54)$ and equivalents wherein:

X is the approximate amount of E. Coli. expressed in colonies per 100 ml;
K_1 is a value in the range of from about -220 to about -420;
K_2 is a value in the range of from about 1750 to about 1950;
K_3 is a value in the range of from about 1130 to about 1330;
K_4 is a value in the range of from about 100 to about 300;

R42 is the value of LANDSAT TM band 4 divided by LANDSAT TM band 2, after subtraction for atmospheric haze separately in each band;
R52 is the value of LANDSAT TM band 5 divided by LANDSAT TM band 2, after subtraction for atmospheric haze separately in each band; and
R54 is the value of LANDSAT TM band 5 divided by LANDSAT TM band 4, after subtraction for atmospheric haze separately in each band.

68. An apparatus according to claim 68 wherein:

K_1 is a value in the range of from about -300 to about -400;
K_2 is a value in the range of from about 1825 to about 1875;
K_3 is a value in the range of from about 1170 to about 1290; and
K_4 is a value in the range of from about 175 to about 250.

69. An apparatus according to claim 68 wherein:

K_1 is a value in the range of from about -310 to about -330;
K_2 is a value in the range of from about 1860 to about 1870;
K_3 is a value in the range of from about 1220 to about 1250; and
K_4 is a value in the range of from about 200 to about 220.

70. An apparatus according to claim 65 wherein the calculated value of E.

Coli. correlates to the actual measured amount of said E. Coli. in said water by a correlation value in excess of 60.

71. An apparatus according to claim 65 wherein the calculated value of E. Coli. correlates to the actual measured amount of said E. Coli. in said water by a correlation value in excess of 70.

72. An apparatus according to claim 69 wherein the calculated value of X correlates to the actual measured amount of said E. Coli. in said water by a correlation value in excess of 60.

73. An apparatus according to claim 69 wherein the calculated value of X correlates to the actual measured amount of said E. Coli. in said water by a correlation value in excess of 70.

74. An apparatus according to claim 65 additionally comprising a report generator adapted to generate a report of said approximate amount of said E. Coli. in said water.

75. An apparatus according to claim 69 additionally comprising a report generator adapted to generate a report of said approximate amount of said E. Coli. in said water.

76. An apparatus according to claim 65 additionally comprising a transmitter adapted to transmit data relating to the approximate amount of said E. Coli. in said water from said processor to a site remote from the site where said measurement takes place.

77. An apparatus according to claim 69 additionally comprising a transmitter adapted to transmit data relating to the approximate amount of said E. Coli. in said water from said processor to a site remote from the site where said measurement takes place.

78. An apparatus according to claim 65 wherein said measurement device is a camera.

79. An apparatus according to claim 65 wherein said processor is a microprocessor having programming instructions for applying said algorithm.

80. An apparatus according to claim 31 wherein said algorithm comprises a linear relationship between said approximate amount of said E. Coli. in said water and sum of (a) the ratio of said first frequency to said second frequency and (b) the ratio of said second frequency to said third frequency.

Specific Devices based upon selected Claims

81. A buoy comprising an apparatus according to claim 65.

82. A buoy comprising an apparatus according to claim 78.

83. A buoy comprising an apparatus according to claim 79.

84. A hand-held device comprising an apparatus according to claim 65.

85. A hand-held device comprising an apparatus according to claim 78.

86. A hand-held device comprising an apparatus according to claim 79.

More Algorithm-specific Self-contained Measurement/Processor Apparatus

87. An apparatus for determining the presence of E. Coli. in water from light reflected therefrom, said device comprising:

(a) a measurement device adapted to measure reflected light from said water, said measurement comprising a measurement of the respective amount of light in at least four frequencies comprising, respectively: (i) LANDSAT TM band 2, (ii) LANDSAT TM band 4, and (iii) LANDSAT TM band 5; and

(b) a processor capable of relating the approximate amount of said E. Coli. in said water to said respective amounts of light by applying an algorithm relating said respective amounts of light in said at least three frequency ranges to the amount of E. Coli. in said water,
wherein said algorithm is any algorithm selected from the group consisting of: $X \approx K_1 + K_2 \times (R42) - K_3 \times (R52) + K_4 \times (R54)$ and equivalents wherein:

X is the approximate amount of E. Coli. expressed in colonies per 100 ml;
K_1 is a value in the range of from about -220 to about -420;
K_2 is a value in the range of from about 1750 to about 1950;
K_3 is a value in the range of from about 1130 to about 1330;
K_4 is a value in the range of from about 100 to about 300;

R42 is the value of LANDSAT TM band 4 divided by LANDSAT TM band 2, after subtraction for atmospheric haze separately in each band;
R52 is the value of LANDSAT TM band 5 divided by LANDSAT TM band 2, after subtraction for atmospheric haze separately in each band; and

R54 is the value of LANDSAT TM band 5 divided by LANDSAT TM band 4, after subtraction for atmospheric haze separately in each band.

88. An apparatus according to claim 88 additionally comprising a report generator adapted to generate a report of said approximate amount of said E. Coli. in said water.

89. An apparatus according to claim 88 additionally comprising a transmitter adapted to transmit data relating to the approximate amount of said E. Coli. in said water from said processor to a site remote from the site where said measurement takes place.

System Using Transmission of Light Measurement Data to Processor

90. A system for determining the presence of E. Coli. in water from light reflected therefrom, said device comprising:

(a) a measurement device adapted to measure reflected light from said water, said measurement comprising a measurement of the respective amount of light in at least three frequency ranges : (i) from about 0.52 μm to about 0.60 μm; (ii) from about 0.76 μm to about 0.90m; and (iii) from about 1.55 μm to about 1.75 μm; and

(b) a processor at said remote site and capable of relating the approximate amount of said E. Coli. in said water to said respective amounts of light by applying an algorithm relating said respective amounts of light in said at least three frequency ranges to the amount of E. Coli. in said water.

91. A method of developing an apparatus for determining the presence of E. Coli. in water from light reflected therefrom, said device comprising:

obtaining a measurement of reflected light from said water, said measurement comprising a measurement of the respective amount of light of at least two frequencies;
developing an algorithm relating said respective amounts of light in said at least two frequencies to the amount of E. Coli. in said water through linear regression analysis;
producing a processor capable of relating the approximate amount of said E. Coli. in said water to said respective amounts of light by applying an algorithm relating said respective amounts of light in said at least three frequency ranges to the amount of E. Coli. in said water;
providing a measurement device adapted to measure reflected light from said water and adapted to provide data relating to said measurement to said processor.

92. A method according to claim 92 wherein said at least two frequencies are in the ranges of: : (i) from about 0.52 μm to about 0.60 μm; (ii) from about 0.76 μm to about 0.90m; and (iii) from about 1.55 μm to about 1.75 μm.